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Report of the Governor of Arizona, 1879 [with] Report of the Surveyor-General of Arizona, 1879

REPORT

OF THE

GOVERNOR OF ARIZONA.

TERRITORY OF ARIZONA,
EXECUTIVE DEPARTMENT,
Prescott, November 20, 1879.

SIR: I have already had the honor to acknowledge the receipt of your letter of the 28th August, requesting a report on the condition of the Territory for the past year.

It gives me pleasure to report the year's advance. The South Pacific Railway has entered the Territory, bringing its result of population and enterprise, and four other great railways are centering upon it. Mining has been so stimulated that its steadily increasing yield of bullion commands the capital to continue development. Our Indians are quiet, and Arizona seems to have at length emerged in security, and with superior advantages to her just position as a wealthy portion of the public domain.

My report of last year was intended to give a general idea of the Territory, and of such of its resources as I thought might be relied on, to constitute its prosperity. In continuation I submit such change as the intervening year has brought, and such additional information concerning the face of the country, its mines and mining resources in particular sections, as I have been able to obtain from reliable and chiefly from personal knowledge, while traveling over the country. The changes which have come to my knowledge are few, and the information scanty, but the change is important and the information exact, and therefore I hope that, in regard to this, the exactness may compensate for the insufficiency. And as this report consists of but little more than notes to subjects for which the first was the text, there will, unavoidably, be some repetition.

The event in this period of dawning prosperity is the entrance of the Southern Pacific Railway, which has stretched its line from the Colorado River some two hundred miles eastward, and opened an avenue for population and enterprise, and stirred into life the dormant resources of Southern Arizona. On all sides other railroads are hovering on the frontier, apparently in doubt as to the lines which they will finally adopt. But whatever may be the routes decided on, Arizona must in any event be their gateway. Within the last few months it had on good authority been reported, and until recently fully believed, that the building of the Sonora Railway of Mexico had been determined on. It is now understood that the project has been, at least for the present, abandoned. This proposed railway is the key to the Mexican railway system in connection with the Western American lines. The main line extends from Guaymas, on the Gulf, north to the boundary of Arizona, with Tucson for its objective point. Its branch line is from Guaymas east to La Bar-

ranca, the point at which are reported to exist large and valuable beds of anthracite coal. Together with its right of way, mineral and other concessions, its charter carries a grant of about fifteen million acres of public land. This line could not fail to open up the adjacent rich country, and it is to be regretted that for the time its construction has been deferred. With this the several transcontinental railways now centering on this border will naturally give to Arizona exceptional advantage in trade with Mexico, and ready development to the resources of the country on both sides of the line. This meeting of the tides of trade on the border will throw together a busy concourse of men who will quickly build up a commercial depot of increasing importance.

Concerning the mineral wealth in this quarter, the journals of the day have currently given general information. I will only therefore insert a brief reference to its leading features, which I have obtained from Mr. H. Shipman, an able mining engineer of large experience and sound judgment, who has lately traveled over the southern part of the Territory:

All of the country lying west of the Chiricahua Mountains has been more or less prospected, and all of it shows mineral in greater or less quantities connected with every separate range. In the Chiricahuas occur the Dos Cabezas gold-bearing ores in very large lodes, as well as numerous silver bearing lodes. Further to the south, in the same range, are found some very large deposits of carbonate ores. Northwest in the Sierra Bonita copper is found, as also many gold and silver-bearing lodes, but all up to the present time very slightly developed. In the Southwest the Dragoon Range shows numerous copper and silver bearing lodes in the same unworked condition. A few miles to the south of the last-named range, begins the famous Tombstone district, in which a considerable amount of work has resulted in developing promising mines, among which are the Contention, the Tough Nut, and Grand Central, besides many other properties that look well for the future. Farther south the Huachuca Range, which is just being opened up, shows veins of native copper, as well as lodes of silver-bearing carbonates. These have been found throughout the whole length of the range, but no sufficient work has been done to determine their value. About thirty miles to the west are the Patagonia Mountains, in which are the Washington and Harshaw districts. In the first-named there has been very little development, but the croppings show immense bodies of ore, from a few feet in width up to two hundred and fifty feet, carrying metal from wall to wall, of zinc blende, iron, copper, and lead pyrites, with a varying quantity of silver. This is mostly of comparatively low grade, but certainly sufficient to ensure its being worked when the greater facilities now near at hand will permit it to be advantageously done.

In the Harshaw district there has been developed the Hermoso lode, which bids fair before long to be at the head of mining properties in Arizona. There are also numerous other prospects of fine ores in the same district more or less of this order. A few miles to the westward are the Santa Rita Mountains, which also carry more or less mineral throughout their entire length. At the north end are the placers from which much gold has been taken in the past, and which are being worked at the present day. In the vicinity are some fine copper properties that promise good results in the near future. At the south end of the mountain are located the Aztec, Toltec, and Calabasas properties, as well as numerous other silver-bearing lodes, having some promise in future developments.

Thirty or forty miles to the westward are the Oro Blanco and Arivaca mining districts. In the first-named are found a great many very large lodes of carbonate as well as sulphuret ores, which are now being developed by several different companies. Some of these promise well, but the character of many is yet to be determined by future working.

Surrounding the town of Arivaca are many locations of very fair ores, but these are not yet developed to any great extent. To the westward some twenty miles is the Baboquivari Range, into which the prospector has just entered. These show many veins of gold and silver bearing ores, and among them a number of old mines that were worked long ago. Some of these promise well to future development. West of the Baboquivari not enough is at present known to form any distinct idea of the mineral character of the country, but it is undoubtedly in general much the same as in the eastern portion.

These ores seem to be illimitable in quantity, and with the influx of capital it is reasonable to suppose that busy mining villages, with a farm-

ing population to support them, will spring up along the line of the railways which are now to open up this region. This growth has already begun since the advent of the southern railway. Silver mills have been put up, mines displaying great wealth have been opened, and a large production is already assured.

In all this region the climate is very pleasant for two-thirds of the year. The remaining third is hot, but not enfeebling or oppressive, nor is exposure to it attended with such dangerous consequences as on the eastern seaboard. The climate is especially agreeable in the southeastern part of this region. Ascending the rivers south from the Gila or east from the Gulf to the elevated land, the character of the country is most agreeably improved. It is sufficiently well watered and in greater part an exceptionally rich pasture ground, which the mild and even climate of all the year makes favorable to animal life. Its annual rainfall is twenty-four inches, and as this occurs mostly in the summer months the grass remains fresh and green the year round. While this part of the country was under protection from the Mexican military posts it supported great herds of cattle and horses, and flocks of sheep. Many years ago the Elias family of Sonora, who were the chief stock raisers of the country, held here several great ranchos, stocked with immense herds, which went largely to the supply of the City of Mexico. When the Mexican troops were withdrawn the Indians destroyed the ranchos. In passing up the San Pedro River in 1849 I came upon scattered bands of cattle which had belonged to them, entirely wild, and prompt to charge upon any man who chanced to be on foot. This grazing country comprehends large tracts of agricultural land which will become valuable because situated in the midst of a rich mining region, and the railroad which is about to penetrate it will carry off its surplus produce. The influence of a railway in giving full value to the capacities of a country is well exemplified by the following instance: It had been supposed that the great and varied fertility of California would bar the agricultural products of Arizona from the coast. But lately the Southern Pacific Railway carried, for seven and a half dollars the ton, ten carloads of wheat raised by the Maricopa Indians, to San Francisco, where it was sold for $2.22 the hundred, the ruling price at the time being $2.10 to $2.15 the hundred. This wheat was shipped to San Francisco by Messrs. Barnett & Block of Maricopa, who purchased it from the Indians. Generally, this instance shows the value of a railway to a new country, but specially it makes two points, both important to this Territory: 1st, that California does not bar the products of Arizona from the sea; and 2d, that Indians can raise good wheat. The Arizona wheat, like that of Sonora, is of excellent quality, due, perhaps, to the climate, which Humboldt says is peculiar to this coast.

Westward from Tecolote along the border toward the Gulf some ten thousand Papago Indians have supported themselves by agriculture, which proves it a habitable country. Here as elsewhere over the Territory are the indications of a former large population, which go to support the impression that the climate has been materially and injuriously affected by the withdrawal of the waters from the head of the Gulf.

As indicative of climate and a former cultivation in this southern region, I may mention the fact that many years ago in traveling northward from Santa Cruz in Mexico, by way of Tucson, I saw a fine, large orchard of peach and apricot trees in solitary bloom in early March—a deserted memorial of the mission civilization which had been driven out by the Indians.

Near the end of February of the present year I found fig trees bud-

ding and apricots in bloom at Phœnix. The cottonwood trees which line the streets were in full spring foliage, and the fields were green with alfalfa and grain.

The town is on the Salt River tributary of the Gila, about 1,800 feet above the sea. The river here runs through a broad valley plain circled by mountains. It furnishes abundant water for irrigation, and the asequias or water-ditches are spread out over the valley in a space eight or ten miles broad. Streams of running water, which one met in every direction, gave a very grateful sense of freshness quite unexpected in this dry country of Arizona, and remains of old asequias used by the former Indian population show that with them, too, it was a favorite place. For seven or eight months of the year the weather is said to be pleasant, but hot for the remainder. The town is the center of an important farming district, and its growing prosperity is secured and made permanent by its position, which is forcibly indicated by the country surrounding it. The trade of a large neighboring Indian reservation has been an element in its prosperity, and now the Southern Pacific Railway passes within thirty miles.

In December last I visited the northwestern part of the Territory. Our journey occupied twelve days and about four hundred miles of traveling. The route was in a northwestwardly direction, over a grass-covered country, across valleys and their separating mountain ranges, and both mountain and valley along the whole route were well wooded with juniper and pine. I was unaccompanied by engineers, and my stay was too brief for any such examination as would enable me to give distinct and useful data concerning the mines. In the Mineral Park Basin the Keystone and other veins have been so far opened by drifts and tunnels as to give positive evidence of valuable ores in great quantity. But the want of means to open the mines systematically and to put up necessary mills have kept them unavailable. Scarcity of water is another impediment here at present; but indications show that it will be obtained in the deep workings of the mines. At Mineral Park there is a five-stamp mill, which, in addition to the Keystone ores, treats such others as are brought to it from other lodes, returning eighty per cent. of the mill assay value at a charge of $50 the ton. To this mill the owners of mines round about usually bring a little selected ore from the workings, by which they are endeavoring to meet the expense of opening their mines.

We had brought with us the mail for Mineral Park, and also for Hardyville and Post Mohave, which are on the Colorado River, some forty miles distant from Mineral Park. At this time there was no mail service to these places. On our way down we carried for the owners of the Keystone mine seven bars of silver bullion to Mohave for shipment, by way of the river, to San Francisco, Cal.

A favoring circumstance in the prosperity of the Territory has been the quiet of its Indians, and it is in this connection that I will refer briefly to my interviews with the Indians in this quarter. Soon after my arrival a year ago Sherum and other principal chiefs of our northwestern tribes came to see me, and asked me to come and see them in their country, and myself see their condition. To do this was one of the principal objects in my journey. I had there the singular experience of finding among the Indians a strong disposition to help themselves and be as little as possible a burden on the government; and with this a sincere intention to be at peace with the whites, if practicable. I found the Mohaves at their home on the Colorado River, near the Mohave military post which has them under surveillance and care. These are

river Indians, and their permanent home has always been on the Colorado. They are an agricultural people and cultivate the Colorado bottoms, which their experience has taught them to farm more successfully than the whites, some few of whom are settled in their neighborhood. They believe that their dead who have been good men go to a mountain about forty miles down the river, in California; and their bad men to the "Dead Mountain," a peak which is in sight to the northwest on the Nevada side of the river. Their superstitions affect their habits. They believe that their dead, who above and below them on the river are in their immediate vicinity, roam after dark. Fearing to meet them they avoid being out after nightfall, unlike the northern Indians, who prefer the night for attack. From a kindred fear of attracting their attention they carefully refrain from mentioning the name of the dead.

So far as a people can be, the Mohaves are rooted to the soil by superstitions, climate, and habits of life, and would be very unhappy if removed. This year their crop had been short on account of the scanty overflow of the Colorado which, regularly as the Nile, furnishes their irrigation. This had reduced them to rely largely on the muskeet bean for their subsistence during the winter, which they will manage to get through, but by spring they would very much need some aid from the government. These people are absolutely peaceable, and the garrison entertains with them kind and friendly relations.

The Hualapai are mountain Indians of a wilder nature and habits than the Mohaves. These know nothing about farming. The men hunt and the women gather a vegetable harvest of seeds from various grasses and plants, and the nuts of the nut-pine tree (piñon). I found them in camps among the mountains, from the neighborhood of the Juniper Range to the mountains about Mineral Park, scattered over a line of about a hundred miles; but game has become scarce and wild, and the stock ranging over the country has diminished the supply of seeds so that they have hard work to get sufficient food and covering. In early times they were at war with the whites, but later became reconciled and friendly, and under General Crook rendered very valuable service in subduing the Apaches. As you are aware, they were put upon a reservation on the Colorado, but the hot river climate to which they were unaccustomed brought sickness among them, and the change of life and the fact that their mountains, where they knew were game and cool air and water, were always in sight, made them discontented and they left the reservation in a body and returned to the mountains.

I talked with their principal chief, Sherum, and others, over their situation and wishes. They satisfied me that they desired to be at peace with our people. Sherum thought that his particular band would support themselves by hunting during the winter and proposed to do so. He requested me to inform the whites that his people would hunt among the mountains as far to the southeastward as Williamson's Valley, but would not in any way interfere with their stock. The danger lies in the certainty of an outbreak if any one should be killed on either side, and this the chiefs seemed particularly desirous to guard against. Sherum said the Indians about the Mineral Park country would be in want of food, and that it would be good if the government would help that band. He seemed decidedly averse to the idea of going upon a reservation, and I think that the fear of it made him willing to struggle with starvation rather than take a step which looked in that direction. He further stated that if any outrage should be committed by Indians, the chiefs of the different bands would themselves, if informed and permitted, arrest the parties in fault and deliver them up to be imprisoned,

This observation of theirs suggests a convenient method of exercising control over these tribes. I made to the Mohaves and Hualapais some such small presents of knives, blankets, and tobacco as I could afford, and gave to the Hualapai chiefs a satisfying supper. My acquaintance with Indians had made me know the value they attach to presents in ratification of a contract or proof of friendly understanding, and I regretted that on this occasion I had no public money at my disposal to give them the substantial present which they would look upon as a guarantee of the friendly intentions of the government. On my way back I informed such of the settlers as I met along the route that the Hualapais would hunt in their vicinity, and they promised for them friendly treatment.

Returning to Prescott, I conferred on the results of my journey with Major-General Willcox, with whom I have had the satisfaction to act in perfect harmony on all matters concerning the public service here. He concurred fully in the opinion that to keep these Indians quiet and peaceable it needed only to leave them in the enjoyment of their accustomed range, and aid them with such occasional supplies of food as would enable them to live.

The Indians have been faithful to their promises, although to do so carried them to the verge of starvation, and they gave no trouble during the winter. Towards the close of this autumn they were found to be in a condition so near actual starvation as to require instant relief. In company with our Delegate to Congress, the Hon. Mr. Campbell, I called upon General Willcox, and in reply to his telegram he received from the War Department immediate authority to issue the Indians rations for sixty days. This has lately been increased by an additional supply which will tide them over the winter and give time to arrange for their permanent relief. Over this northern part of the Territory lies the projected line of the Atlantic and Pacific or Thirty-fifth Parallel Railway. The face of the country presents mountain ranges with broad intervening valleys running into each other by easy passes. The hills and lower ridges are wooded with juniper and piñon pine, worthy sometimes to be called forests, the higher ranges with yellow-pine. The valleys, occasionally of several hundred thousand acres in extent, are covered with varieties of the most nutritious grass, among them bunch and gramma grass. This would be notably a grazing country if water could be had, but the scarcity of it repels settlement, and at present it is mostly unoccupied. The great trough of the Colorado near by seems to have drained it of all except what is afforded by occasional springs and the streams in the higher mountains. But no attempt to store and retain water by dams, or to obtain it by artesian or flowing wells, has been made. Neither the face of the country, therefore, nor its character, presents any obstacles to the construction of this intermediate railway which the necessities of the region will eventually require.

Except its bottom lands, which are of unusual productiveness and strength, the valley proper of the Colorado below the cañons, that which lies between the bordering river hills over a space of fifty miles, is dry, hot, and barren. All else is fertile and habitable. In its east and west course running through the northern limit of Arizona, the Colorado borders and incloses a beautiful country. Here in the cañons the Indians, from a remote time, have grown excellent fruit and grain, and with their produce have maintained a primitive trade with other tribes. In fact this whole northern region has the resources to sustain a wealthy population, and create a permanent and valuable trade for the first railway which has the enterprise to penetrate it. The climate is healthy and the country fertile; wooded and grassed from the Colorado Hills eastward into

New Mexico. Water in abundance will undoubtedly be had when adequate means are employed to get it. Its inexhaustible grasses will support immense herds, and its great coal fields and heavy forests of timber, continuous through the territory, will command a ready market. It has broad valleys of farming land, and its mining districts, copper, silver, and gold. With these inducements to immigration, and these materials for permanent traffic it will not be long before some one of the competing railway lines will open up this region to the seaports of California. A glance at the map will show the great extent of country which would of necessity be tributary to such a railway, and in view of its certain development it is matter of surpise that this line remains unoccupied.

About the middle of September I visited the country south of Prescott, within a range of fifty miles. This is a mountainous, wooded region. Mr. Charles Silent, judge of the United States district court, and Mr. George W. Maynard, mining engineer, were of the party. I give here our excursion in journal form for the reason that the face of the country presented, the incidents and facts in detail, will give a more useful view to any desiring to move into the Territory.

Leaving Prescott on the 10th, we traveled directly south over a country wooded with pine and small oaks. Bunch grass, in the usual scattered growth, appeared through the open woods, the usual fall flowers were in bloom—asters and golden rod—and the country had a look of freshness, although there had been no rain. The way was by a wagon-road, good, smooth, and firm, as usually are the roads over granite countries. Knolls, capped with granite masses, and scattered blocks strewn around, were frequent. We crossed no running water in any of the ravines, but, in about five miles, reached a spring with good cool water. In this neighborhood are many small gold ledges which are reported rich. A considerable amount of gold has been taken from them, and they are still being profitably worked. In ten miles we reached the Senator gold mill, on the West Branch of the Hassayampa Creek, at the foot of the Hassayampa Ridge. The mountain sides here are steep. Tall, straight firs are mixed with the pines, and the scenery has a true mountain look. But the creek bed was dry, as were all the ravines. The drought, which has prevailed also over the neighboring Territories, has intensified the dryness usual here. Farther along we came to a cabin at the foot of the Hassayampa Pass, where a settler has had the courage to believe that he could find water. He had sunk a fine well in the ravine, and the abundant water in it looked very refreshing. We ascended to the pass by a tolerably good road, cut in the mountain side, passing on the way the Senator gold mine, which is on the summit of a ridge about eight hundred feet above the bed of the Hassayampa Creek. Water at present interferes with work in the mine which it is proposed to open by a tunnel from the level of the Hassayampa. Northward from the pass the country shows wooded or grass covered to where the view is closed by the rugged mass of the Granite Mountain. Southward the view is over successive ranges to the foot of the Black Hills, where there was a slight glimpse into the Aqua Fria Valley. We continued our way down from the pass along the East Branch of the Hassayampa, passing on the road some cabins and a number of arrastras and water-wheels for working gold rock, but these were now all idle, as the creek was dry. High up toward the summit of the mountain the opening of the Crook gold mine was visible with the road along the hillside down to the mill on the creek. In about six miles from the East Branch we reached the station of Mrs. Spence, where we made a noon halt. Fresh butter, buttermilk, eggs, chickens, and vegetables made a good lunch,

which I mention because these things show what may be done, even in the isolation of this rough country, when there is a disposition to make a home comfortable.

On the side of the ravine was a well of good water, neatly roofed over and the house, solidly built of squared logs and well finished, suggested ideas of shelter and bright fires when the winter should bring the snow into the solitary valley, where it sometimes falls several feet deep. There was good range here for stock and on the farm are two never failing springs which supply the necessary water. In this valley a few miles from the station are gold-bearing ledges which are being opened, and near by a silver mine is being worked with good profit. The wooded country continued, and in the afternoon we crossed the Turkey Creek Ridge and descended by a steep road cut out along the mountain to a dry creek bed, from which we followed a rough stony ravine for about four miles, to Alexandra, a cluster of some twenty houses, originally dependent upon the Peck mine. On the way we had crossed Battle Flat, where some few years ago seven men defended themselves for a day against a large party of Indians and got off with their lives by an accident which caused a panic among the Indians.

The Peck mine was discovered in 1875. It is in the lower hills of the North Bradshaw Mountains, about thirty miles from Prescott. The mill is immediately at the mine, near a creek bed now dry. The mine furnishes abundant water for the works. The village is on a flattened spur of the bordering ridge, in which there is a number of rich silver mines. The property is in litigation and at this time nothing was being done at mine or mill. We therefore did not examine the workings which are reported five hundred feet in depth. The general course of the vein is north and south, lying along a dike of quartzite rock, with a variable width of one to five feet. The mineral veins are also variable, probably not exceeding two and a half feet thick. They consist of rich chlorides of silver and sulphuret, with lead carbonate and sulphuret. I was informed that a hundred tons of the high grade ore from this mine were packed on mules twenty-five miles to the Aztlan mill, at a cost of thirty-five dollars the ton. The hundred tons yielded by pan process seven-hundred and sixty dollars the ton, and the tailings which, after a short time were worked over, gave three-hundred and fifty dollars the ton; making for the total result over eleven hundred dollars the ton.

Professor Maynard gave the following day to close examination of the Silver Prince and Black Warrior mines which occupy both sides of a hollow around the head of a ravine leading to the Black Cañon of the Aqua Fria River. These lodes are on the east side of the village ridge and are sufficiently opened by tunnels and shafts to prove the character of the ore. Their general bearing is north and south. The Silver Prince mine consists of three paralled lodes, called the Silver Prince, the Little Prince, and the Princess. The indications are that these will unite and form one vein on the deep workings. The ore may be called exceedingly rich. The development has been made chiefly in the Silver Prince lode. About ninety tons of ore on the dump, taken out at the principal opening, gave from a sampling rather below than above the average, a value of $224 the ton. Samplings from different parts of the vein over a length of 1,400 feet, and from both foot and hanging walls, gave values from thirty-nine dollars to eight hundred and sixty-three dollars the ton. A seam of thirteen inches thick, eighty feet below the surface, and sampled for its entire exposure, gave a value of six hundred and fifteen dollars the ton, and in the continuation of the stope, five days afterward, showed a value of eleven hundred and thirty-seven dollars the ton. Sink-

ing to a greater depth, the mine is now reported to show a vein four feet thick, yielding ore worth $1,000 the ton.

The Little Prince has had no further development than a single shaft one hundred and thirty feet deep, from which, about midway in depth, a drift has been run fifty feet. It was not found rich enough to stope, though occasionally bunches of ore of great value have been taken out and shipped to San Francisco. The owners state that in the sinking they extracted and sold $15,000 worth of ore.

The water which had been for several months standing in the shaft had been only partially taken out in buckets, the caving in of the hanging wall making it dangerous for the men to continue work. Although there has been no continuity of paying ore in this sinking, Mr. Maynard thinks that the rich bunches of ore which have been cut from time to time, coupled with the well-defined character of the lode, justifies a systematic exploration. About eighty-five feet below the surface he sampled a small pocket, which assayed $3,043 to the ton. Another sampling from the vein at its full width, at the depth of one hundred feet, assayed in silver $28.26, and gold $16.12; total value, $44.38. A sample at the water-level gave in silver $212 the ton. The water in the shaft rendered it impossible to verify the statement of rich ore on the bottom.

In the Princess lode not enough work had been done to make an examination useful.

The Black Warrior mine, which is on the same lode and adjoining the Prince, but on the other side of the hollow, is yielding ore which in appearance is of a different character; probably it is now at the water-level. Seventy tons of ore, taken from this mine and worked at the neighboring mill, gave a value of $114 the ton and a net result of $96 the ton.

During the two months following this visit the work at these mines has strengthened the estimate of their value. The water-level tunnel of the Black Warrior shows a five-feet face of very rich ore, and in the Silver Prince a seam of rich ore was opened four feet wide, carrying about one thousand dollars to the ton. Both mines give unusual and strong indications of rich and permanent ores. The two carry nearly three thousand feet of mineral vein, and should be worked together. Below the water-level the deep workings in the mines will furnish abundant water for a mill below the outlets of the tunnels.

On the morning of the 13th we continued our journey, which now was on mule or horseback, as there are hereabout no practicable wagon-roads. The way was by mountain-trails, over rough and wooded country. In every direction the view is over a bed of steep, close-packed mountains, the intervening valleys making slight show. After a few miles we descended by a steep trail into the Bradshaw basin, and at noon halted at the Bradshaw silver-mill, where we were hospitably received by the proprietor, Mr. Bowen. This is an unfinished mill of ten stamps, with a saw-mill attached, which had cut lumber for all the works and was now cutting it for the neighborhood. Water is supplied from springs, as the creek at this season is dry. A narrow, rocky gorge, through which the creek passes, offers an admirable site for a dam. We resumed our trail in the afternoon, and towards evening reached what is called Bradshaw City, and in the midst the Tiger mine. The village is on both sides of a ridge, which is traversed by the Tiger lode. On the north side is that part of the village which sprang up at the discovery of the vein, and the houses are mostly of stone, intended as a better defense against the Indians, who at that time made the country dangerous. These stone houses keep in mind the brief time since men defended

their discoveries with their lives, where now the bars of bullion are expressed to the railway with commercial regularity.

The mine and mill are on the south side of the ridge, where the new wooden houses show prosperity and more peaceful times. Mr. Helm, the superintendent of the Tiger mine, very kindly gave our expert every facility to examine the works. The mill is of ten stamps, and makes a pleasant impression by its completeness and the systematic order in which the machinery is arranged. It is a model establishment.

Professor Manyard occupied nearly two days in examining the mine and inquiring into the cost of mining and the treatment of ore. His examination resulted in showing that the present rate of production, without increasing the capacity of the works, would give a yearly gross yield of over half a million of dollars, at a cost of thirty per centum, and consequently a net yearly profit over all possible expenditures of $350,000.

On the afternoon of the 14th we rode over to the Oro Bonito and Gray Eagle mines. The trail led along the face of the mountain for about two miles and down along several steep slopes to an open ravine, on the east side of which are the mines. After using the afternoon in looking over these we returned for the night to the Tiger and the hospitable house of Mrs. Crook, and in the morning completed the examination of the Gray Eagle. The ores in these mines are gold and silver, the greater part gold. They are well explored by shafts and tunnels at different levels to the depth of 250 feet. Each has over six hundred feet of tunnels. From the samples of ore carefully made throughout these mines the Grey Eagle gives an average of over one hundred dollars to the ton, and the Oro Bonito the same. The Oro Bonito averages about three feet in thickness, and the Grey Eagle in its lowest tunnel about nine feet between well-defined walls, representing a very strong vein. The two are parallel and about 2,500 feet apart, running nearly north and south. The ledges cross the ravine, and on the opposite side the Grey Eagle reappears at several points where the vein shows free gold. The creek-bed is dry and there is no water at the Oro Bonito except in the lower shaft; it was pure and cold and of good quality At the Grey Eagle there is a fine spring of good water called the Ash Spring, which affords water sufficient for a small mill. Higher up the mountain there is said to be a group of springs which would furnish water for 60 stamps. Leaving these mines and riding up the ravine, we ascended to a saddle in the mountain overlooking the Bradshaw Basin, where the trail on the right leads off to the Aqua Fria mines and on the left descends into the basin. Near this point on the ascent we passed the Cougar and Eclipse and other silver lodes, and, continuing along the face of the mountain to the right, passed some time in examining the Loreno ledge. These have not yet been sufficiently explored to give reliable data as to the character and strength of the lodes. But so far as they have been opened they give promise of large and valuable mines. In fact, the whole country round about this basin is rich in its numerous gold and especially silver mines.

Descending from the mountain, we nooned at the mill, and reached Alexandra late in the afternoon. The 16th was devoted to further examination of the Silver Prince and the Black Warrior mines, and the next morning we set out on our return to Prescott. The woods had been on fire towards the north, the atmosphere hazy and smoky like Indian summer in the east, and the weather during all the journey had been very pleasant: the nights cool and the mornings and evenings delightful. We made our noon halt at the thrifty Spence Station.

In the afternoon the sky was covered with threatening dark clouds, and showers of rain, as we ascended the Hassayampa Pass, freshened up the mountains until, with water shining on shrubs and trees, they looked like the Alleghanies. By sundown we were in Prescott.

A few days afterward Mr. Maynard made an examination of the Silver Belt and Cabinet mines, which are in the foothills of the Bradshaw Range, about twenty miles from Prescott. The direction of these lodes is northeast and southwest. The main shaft is 120 feet deep, and short levels have been run at different depths, the longest 100 feet. The foot wall of the vein is a white limestone. The hanging wall has not been sufficiently determined, but where exposed in the vein is a chlorite slate. Although these ores are exceptionally rich, the silver-bearing veins are very narrow, and the development at the time of Mr. Maynard's examination was not yet sufficient to determine if the ore increases in width in sinking, but its great richness justifies an extended exploration. It is essentially a smelting ore, easily worked, and the entire smelting expenses would not exceed twenty-five dollars the ton. In the neighboring mountains are extensive forests, and the Aqua Fria River, which runs at the foot of the slope on which are the mines, has a head of water equal to ten thousand gallons the hour. Pending the erection of smelting works, ore rich enough for shipment to San Francisco might be extracted. Samples from ten different parts of the mine give a range of values from $47.13 to $961.38. The samplings extended throughout the openings and gave the following results:

	To the ton.
No. 1. From vein of galena two inches thick, ledge consisting of galena and slate over 2 feet wide	$56 56
No. 2. Galena and ferruginous quartz	420 98
No. 3. One foot ferruginous material, a little galena mixed with it	53 46
No. 4. Galena mixed through decomposed rock	264 86
No. 5. Sampling from vein at water level 1 foot thick; width between walls 38 inches	414 70
No. 6. Sampling from vein 26 inches thick	527 82
No. 7. Sampling from 3 tons on the dump	402 13
No. 8. From face of a drift from shaft No. 1	47 13
No. 9. From south face of drift from shaft No. 2	219 91
No. 10. Sampling from south face of shaft No. 3	961 38

Since this examination the working of the mine has been attended with a steady improvement in the grade and quantity of the ore. In the newer part of the mine good ore is displayed 18 inches in thickness on a length of 170 feet, and in the old workings a vein has been opened of exceptionally high grade ore 42 inches in width.

We left Prescott early on the 29th September for a visit into the Black Hills, a prominent range of mountains to the eastward. Our party consisted of Professor Maynard, and Mr. Francis Frémont, with Mr. Hugo Richards, the owner of a copper mine which was the object of our journey. We were to have started on the 27th, but were prevented by an unexpected and refreshing rain, which was general over the country and lasted from twenty-four to thirty-six hours. The road for about 10 miles led nearly north down the valley of Granite Creek, which afforded a good and pretty road, the creek being wooded and the hills grass-covered. On the way we passed several dairy, fruit, and vegetables farms, with good buildings.

The water of the creek sinks, showing only in holes, but near the Point of Rocks, a ridge of granite masses famous in Indian times, it reappears as a running stream. Below, at Clough's ranch, where we crossed it, it was again a dry sandy bed. The farm, which now is a mile higher up, is called "The Point of Rocks Garden." Granite and Willow

Creeks unite here just outside the rocks, which are three or four hundred feet high. At this place the streams are permanent, but below the farm the water sinks again, and where we crossed was already under the sands. This seems to have been a favorite abiding place of the extinct population. Many ruins, stone walls, and fragments of pottery strewn about show that this was one of their permanent towns.

From Clough's farm our course was directly west for ten or twelve miles over a broad valley entirely covered with gramma grass, showing through its yellow, fall tinge occasional green. As we approached the Black Hills we passed a smaller outlying ridge of smooth conical hills, in which gold veins are said to exist. To-day there were clouds in the sky, and their shadows in great dark patches on the mountain seemed to make their name of Black Hills very appropriate. We entered the mountains by an open flat ravine wooded in the bottom with walnut and thickets of scrub-oak and scattering junipers. On either side rose fertile mountains high and steep, covered with bunch-grass and wooded openly with juniper and pine, and rising to summits perhaps two thousand feet above the valley. On our way in we passed on the right a strong well-defined vein of brown hematite iron-ore. The only work done consisted in stripping the face of the vein and taking out a little ore which was piled up at the foot of the hill, probably to hold the claim. The face of the country improved as we advanced, and in two miles we reached the stock farm of Mr. Saunders; we had met his cattle scattered along the ravine and outside the hills. There is a well here, but no water had yet appeared in the creek bed. We now exchanged wheels for horses. A few hundred yards above we came upon a good and permanent water-hole in the creek bed sufficient for stock. The valley here is about 500 feet above Prescott, and this is probably the water-line at which the springs issue from the mountains. Here the rock formation and the face of the country changed. We were coming closer upon the mountains, which on either hand had towered over the ravine, not close enough to appreciate fully the change. This whole valley bottom was wooded. Huge trunks of junipers, mixed with solid pines, over three feet in diameter, and walnut, oak, and ash trees of more vigorous growth than below. The flat of the narrow valleys was strewn with rocks swept down by waters or fallen from the mountains, among which a rude wagon-road led to the point where it was to leave the valley. The rock was now blue limestone highly inclined. We began the ascent of the mountain near the head of the valley, and here we came in contact with the real beauty of this region, which was everywhere clothed with a close growth of bunch-grass still partially green and vigorous, offering a stock range equal to any I have ever seen, provided water were abundant. A wagon-road had been worked here along to the top of the mountain, which consisted of an open flat or slightly undulating country among occasional summits rising to about 8,500 feet above the sea. This upper country was like a park. Entirely covered, like a carpet, with grass, on which grew the open pine forest with occasional oaks and junipers, but without any undergrowth or shrubbery. The milky softness of the dry Arizona air was freshened by the late rain, and the pine-scented mountain breeze was most delightful. We saw no game, though deer are frequent in these hills. The wagon-road which had been worked up the side of the mountain turned off to the southward at the top, leading to a farm about two and a half miles distant, on a still higher table of the mountain, where the grass grows knee deep and is still better than here, and where there is a spring which had not been known to fail until this year, when, under the persistent drought, it gave out in July.

Probably this spring marks another change of formation. About this farm the snows usually fall eighteen inches deep. Riding along eastward we presently came into full view of the valley of the Rio Verde, some twenty miles broad and some four thousand feet below, the blue wall of the Mogollons rising beyond. The sun was shining on the reaches of the river, and green patches along the valley showed cultivated spots. Masses of white clouds were scattered over the sky, the yellow grass of the valley was flecked over with the cloud shadows, and all shone out splendidly against the blue *mesa* of the Mogollon Mountains which stretched along the farther side. Nowhere in all our mountain countries have I ever seen anything more beautiful than, in their way, were these broad stretches of mountain meadows, and the shining valley below. This great *mesa*—the Spanish term for table-land which has obtained in these countries—seems to front the main range of the Mogollon, and its level line suggests that it is composed of horizontal strata of the same limestone which is found on this, the western, side of the valley.

Descending about 700 feet we continued along a narrow flat valley between spurs which rose high on either side. The character of the country remained the same. On both sides beds of limestone appeared, apparently four to five hundred feet in depth. They consisted of horizontal strata, sometimes massive in thickness, and at others made up of numerous layers, with perpendicular faces. At times there were indications of caves in the rocks. A trail to the Verde Reservation leads down the hollow, and a little farther below is a spring called the Willow Spring.

After a few miles we turned up the side of a spur on our left, and crossing this we descended into another valley at a point called Buffiner's Camp. This little valley was a gem among the hills, fresh and green with the woods which entirely filled up its bottom lands; walnut, oak, ash, box-elder, and other trees. Fine springs break out here at the foot of the hill, making a cool and lively little creek, which seemed to fill the air with freshness and was pleasant to look at. In this country running water is one of the pleasantest things to meet.

Some tents were pitched here, this being the camp of the men occupied in opening the copper mine which we had come to examine. It was now two o'clock, and as we were to spend the night here we resumed our way to the mine. The trail led along the face of the spur on the left crossing, which we came down by a steep trail to the ravine where the mine is found, in something over a mile from the camp we had left, and about a hundred and fifty feet below it. The mine is on the south side of the ravine, and the ledge crops out on the opposite side, and is traceable over the hills for about seven miles in a course generally north and south. The lode is opened on both sides of the ravine. On the south, at the point where we were to examine it, the face of the hill had been stripped off, showing a massive vein fifteen feet in thickness. The following is an extract from Mr. Maynard's report:

On the line of the ledge wherever there has been any digging to the depth of a few inches, bowlders of malachite and cuprite with veins of copper glance in the cuprite are found, together with detached masses of country rock. The ledge has been exposed at two points on the surface and stripped at right angles to its course for a width of fifteen feet. Two samples of ore were selected from openings No. 1 (the upper opening), the one mainly malachite and copper glance and the other cuprite. The assays were made by two local assayers, with the following results: copper in malachite and copper glance, 42.44 per cent.; one determination of silver gave 1.21 ounces and the other 7.29 ounces to the ton. Sample No. 2, principally cuprite: copper, 36.60 per cent.; silver, 6.05 and 4.86 ounces.

No. 2 opening is fifteen feet wide by about nine feet high, the ore mass being made

up of bowlders of malachite and cuprite, and is almost devoid of barren rock. The ore was sampled across the entire face and assayed in copper 57.88 per cent., the two silver assays being respectively 2.91 and 3.64 ounces.

A tunnel has been driven below the lower open cut, with a due north and south bearing, one hundred and forty-one feet in length. The tunnel enters the mountain through a talcose slate and a deep red clay, carrying small bowlders of malachite and cuprite, and in the tunnel there are occasional bowlders of quartzite. One hundred and twenty feet from the mouth angular masses of ore were struck for the first time, imbedded in red clay. At the face of the tunnel and in the roof the bowlders and masses were more compacted, but I failed to find the usual characteristics of a properly constituted vein or lode either in the tunnel or short cross-cuts east and west, the former being 6 feet 5 inches and the latter 10 feet 7 inches long. I was not able to find any semblance of wall rock; the cross-cut must decide this. The appearance of the lode, if it be one, is that of a great crevice filled with highly ferruginous clay bedding huge bowlders of ore. It is probable that the workings, which at the time of my visit were only eighty feet below the surface, are still on the back of a lode, and that in the depth the copper will be found to occur as a sulphuret. This view is strengthened by the fact that small masses of sulphurets have already begun to come in. For example, in the cross-cut, I picked out a nodular mass of pyrites which on assay was found to contain copper 4.88 per cent., and silver, by one assay, 43.74 ounces, and by another, 49.84 ounces, an unlooked for result. I could not find any other similar masses. The red clay from the west drift assayed copper 1.72 per cent., silver 2.43 ounces, and a very ferruginous piece from the roof at the end of the tunnel, copper 9.04 per cent., and silver 3.93 ounces and 3.64 ounces. At the mouth of the tunnel on the dump there must be 25 to 35 tons of bowlders of the same character already mentioned, extracted from the tunnel in the course of the driving. I do not consider that these are sufficient data to determine whether this is a true lode or not, but that there is a very large body of exceedingly rich ore there can be no question.

I am informed that several tons of surface ore were smelted at a rude works on the Aqua Fria Creek, two tons of ore being smelted for one ton of block copper. This product I have had assayed for the purpose of determining in a larger way the amount of silver contained in the surface ore, the result, 17.01 ounces = $21.99; too small an amount to be paid for by the copper smelters. There has been too little development to determine if the tenure of silver will increase in depth, but it may be well to make two grades of ore, one rich enough in silver to pay for parting, and the other as free from the silver-bearing ores as possible. Future developments can alone determine the true course to be adopted. It may safely be assumed that the ore will average 25 per cent. in copper without any close selection, and that, consequently, four tons will produce one ton of block copper containing 95 to 96 per cent.

At a distance of 150 feet and parallel to this is another vein, about 4 feet thick, from which specimens assayed have given a very high value, and farther, at about a quarter of a mile distant, is still another vein not yet opened, but which is very promising in its indications.

In the ravine, a little below the mine, is a spring, but it is highly impregnated with copper. The water from the Ruffner Spring can be readily brought in pipes to the mine, which is 150 feet below the spring. Examinations which have been made over the intervening ground show that from this mine a good and easy wagon-road can be carried over the mountains into the valley leading to the Aqua Fria Valley and to Prescott in a distance of about 28 miles, and at a cost of $10,000.

From what I was able to learn in regard to other springs in the ravines of these mountains along the Verde Valley, I judged that these break out at about the level of the Ruffner Spring. It would have been interesting to have examined this in connection with the formation, but we were not prepared for anything more extended than the work in hand. So we returned to the camp, where Mr. Riggs, who has contracted for running the tunnel, gave us a good supper, with good tea which we knew would be rendered complete, as we had heard the tinkle of cow-bells in passing. The camp-fires were pleasant and needed, for the clouds seriously threatened rain, and among the hills the night is chill. We had a sound sleep on the ground, and after a good breakfast in the early morning we turned back on our way to Prescott, which, after a noon halt of an hour at Saunders's, we reached at four in the afternoon.

The tunnel has now, November 20, penetrated the mountain 262 feet, and the face and sides of the tunnel are in solid ore. So far the working shows a width of at least 40 feet and the limit not yet reached. The probability is that in this bed the ore will be found successively in large bodies, imbedded in red clay, and superimposed one above the other like the links of a hanging chain, somewhat as in the Comstock lode, and that, as the water-level is reached, the malachite and oxides will give place to a uniform sulphuret. The fact remains established of an immense body of rich ore rarely equaled.

The prevailing impression made by these journeys is that Arizona is a *country of minerals*, and that mines of unusual and proved richness are already known to exist in it. These are its chief resources and the chief field for its labor. There are wood and grass and farming lands, but these do not invite settlement nor attract labor. They are in a manner dead, because that which is for them the principle of life, the water, which would make them available to labor, is wanting; but the mineral, which of one kind or other and in greater or less quantity is in every ridge, can always be had. And this is available to labor, because in the beginning but little work and less capital are required, and for this there is water enough, and there is always that chance for sudden wealth which gives to labor here its attraction and excitement. Therefore the foremost idea associated with the country is mining, as it is also the foremost idea in the minds of the people. All else is subsidiary and subordinate, and dependent upon it.

The climate of Prescott has long successions of bright, spring-like days at all seasons, varied with occasional intervals of stormy winds from the southwest, which are sometimes violent for days together, and which cause a nervous excitement and irritability that seem peculiar to the locality. The air is very dry, and in spring, when the prevailing southwest winds are long continued, the atmosphere and winds are highly electric and persons and things in a singularly excited condition. At such times the action of shaking hands or touching animals or metals, almost any ordinary contact, brings out sparks with the usual stinging sensations and noise, and streaks of light follow the hands in touching clothes at night. In the neighboring woods the trees are so frequently hurt by lightning that many are unfit for lumber, and in summer thunder-storms the ground is sometimes covered with a continued blaze. The sunsets are singularly brilliant. The sun goes down in beds of orange and flame-colored clouds, succeeded by nights clear and equally splendid, with an unusual brilliancy of stars in the apparent greater contiguity of the heavens.

Maj J. C. McKee, U. S. A., surgeon and medical-director of this department, has kindly furnished me with the following statement concerning the climate of Prescott, and has also permitted the use of it in this report. It is valuable for the distinct information which it gives and its consequent usefulness to those wishing to come to this part of Arizona, and it also enables me to give in this way a satisfactory answer to the many inquiries I am receiving on this subject. I have to regret that these observations relate to Prescott only, but they are, nevertheless, applicable to many parts of the country which are at the same elevation and under the same conditions:

In this Territory there are at present no permanent or recognized places of resort for invalids. This place (Prescott) will, when the country is settled up, become such, on account of its elevation (5,700 feet), its aseptic air, and its freedom from malaria. Diseases of a malarial type are particularly benefited by a residence here. It has some considerable reputation on this coast as a resort for consumptives on account of

its elevation and the purity of the air. I have knowledge of some four cases; one now living here for some years has been greatly benefited; one unfortunately too far advanced terminated fatally; one subject to hemorrhages was recommended to seek the sea level, on account of the increased heart action induced by the altitude—the change I am informed has been of benefit: and one, for like reason, was sent on a sea voyage to the Sandwich Islands, who reports great improvement since his arrival in Honolulu, having gained some ten or fifteen pounds in weight. The prevalent winds are from the west and southwest, and in the spring are quite steady, but not unremitting or incessant. There are no sudden gusts of warm or cold winds, and the air is comparatively free from dust.

The annual mean temperature is 65 .49. Winter maximum 67°, minimum 27°. Spring maximum 81°, minimum 43 . Summer maximum 98°, minimum 71°. Fall maximum 86°, minimum 50°.

Heat radiates with great rapidity, on account of the bare granitic mountains and valleys, unprotected as they are by forest foliage, making a very observable and marked difference of temperature between day and night, requiring great caution in the way of protective underwear. In the hot months the nights always require for comfort a pair of blankets.

The amount of rainfall for 1878 was 14.83 inches. There are about forty-seven or fifty rainy days in the year. During the month of August, 1878, 8.88 inches of rain fell, and in October there was none. The ground dries very rapidly and the drainage is excellent. A small mountain stream, Granite Creek, runs through the town and Whipple Barracks. This generally sinks in the dry and hot months, but by sinking wells down some twenty-five or thirty feet to the bed-rock of the creek an abundance of pure mountain water is obtained of the very best quality. The surrounding mountains, except the granite ones, are covered with pine and other trees. Malaria does not exist.

Catarrhal affections are the prevalent disease. There are rarely epidemics; as small-pox, scarlatina, diphtheria. Typhoid fever never prevails, at least I have never seen a case. There is muscular and occasionally acute rheumatism. Flannel or heavy knit underwear is necessary the year round.

The diet is not as varied as it should be. Horseback exercise and walking are enjoyable almost every day in the year, the mountains affording a variety of pleasing scenery.

While recently in Washington I suggested for your consideration the expediency of an examination around the head of the Gulf of California, with the object of bringing back the gulf waters to an ancient basin from which they have receded for a time unknown. That the withdrawal of the gulf waters from this basin essentially affected the climate and vegetation of the neighboring region is not a matter of doubt. There are many indications which fairly lead to the impression of a gradual decrease of water and moisture over all the region which was formerly exposed to the influence of the gulf winds from that quarter. This, too, is made probable by the fact of the abundant rainfall and green and habitable country which, I believe, exists wherever the gulf influence reaches. Over the basin the rainfall must be slight. At Prescott, though among mountains, but where the prevailing winds are from this southwest quarter, it is less than nine inches, while at Tucson, more exposed to the gulf winds, it is twenty-four.

So far as I am informed, Dr. J. P. Widney, of Los Angeles, first made the refilling of the basin a subject of practical inquiry. After several years careful study he published in the "Overland" for 1873, an interesting paper on the flooding of the basin by turning into it the waters of the Colorado River. Dr. Widney examined into the topographic and geologic features of the desert; investigated the climatic peculiarities of the surrounding region and traced the connection between the drying up of the basin and the arid country now found. In this connection he says in the article referred to:

The yearly evaporation in the Bay of Bengal, as shown by the published proceedings of the Bombay Geographical Society, is more than sixteen feet. This portion of the gulf which is surrounded by high mountains reflecting the sun from their bare sides, shut off from the cool winds of the ocean, its waters shallow and easily heated,

must have been a steaming caldron, keeping the air currents above constantly saturated with moisture. This evaporation, however, estimated at the rate before given, would be enough, if all recondensed and precipitated, to supply twelve inches of rain to 86,400 square miles—more than double the area of the State of Ohio.

I am informed that in the summer of 1873, shortly after the publication of Dr. Widney's paper, Mr. William S. Chapman, of San Francisco, sent out a party at his own expense to examine into the feasibility of the project. I have not learned the result of this reconnaissance except that the engineer in charge, Mr. James, confirmed the reasonableness of the conclusions in the "Overland" article, and further reported an important fact which would appear to greatly lessen the difficulty of turning in the water from the gulf rather than from the river. He reports that he found a lake reaching nearly across the barrier separating the gulf, and that it would only be necessary to cut through the barriers between the lake and the desert on one side and the lake and the gulf on the other. In the winter of 1873–'74 numerously-signed petitions were forwarded to California Congressmen from Los Angeles, San Diego, and San Bernardino, asking action from the government on the subject, but it does not appear that it was ever acted on.

In the spring of 1849, returning from an expedition into Arizona and Sonora, I crossed the basin for the first time. In that and the following years the gold of California made this hitherto unknown and uninhabited country a familiar passage into that State. It became, consequently, for years past a subject of much discussion. My attention had been again drawn to it in 1869–'70 by surveys looking to San Diego as the terminus of the Southern Transcontinental Railway line, then under my direction, and occupation with Arizona lately revived my interest in the subject. Mr. Charles Crocker, president of the Southern Pacific Railway, has kindly furnished me, through Chief Engineer Col. Geo. G. Gray, with a profile and sketch along that part of the line which passes over the northern end of the basin. From these I have drawn interesting information concerning its extent and depth. As the territory embracing it lies partly in Mexico, I submitted the project for its improvement to the Mexican minister at Washington, Mr. Zamacona, with whose earnest efforts to increase trading intercourse between the two countries I had the good fortune to be personally acquainted. He transmitted to his government a note which I prepared, and, while waiting its decision upon it, I am assured of a friendly and comprehending interest from himself in the subject.

With the change of climate that would follow the restoration of the waters there would undoubtedly be a change of vegetation over all this region. Date trees and other varieties of palm might be made to flourish here in a congenial climate, and many trees and plants of commercial value would replace the cactus desert growth. Southward large tracts of land, lying along the Lower Colorado and the head of the gulf, are reported to be of strong fertility, peculiarly well suited to hemp, sugar, cotton, and kindred productions. These lands would all be made available. Formerly the Indians of this country grew and manufactured cotton, and lately a variety from Chinese seed, resembling in its staple the sea-island cotton of the Gulf States, has been successfully grown on the San Pedro River. Sugar is already a production in the Salt River Valley, which is eighteen hundred feet higher and farther north.

The work of redeeming the basin region and turning it to the advantage of the surrounding country would be full of interest if found practicable, and I have dwelt on it in the desire to bring it favorably to your attention. It may be considered a mere speculative idea, but in any

event it would require but a small expenditure of money and time to know the facts and dispose of the subject.

What I have been able to report to you will carry with it the conviction that there are elements of great wealth in this Territory. In closing, I wish to add that further knowledge of the country has made me realize more strongly the necessity of some aid from the government to increase the water supply. By necessity, I mean to be understood that the resulting advantages are so great as to make it incumbent on the government in the ordinary care of its property to give the required aid, which, if effectively supplied, would involve an expenditure too large and comprehensive for individual enterprise. To encourage the farming interest, to develop the mineral wealth, and to utilize the grazing capacities of the country, water must be had. Without this the country cannot be used for what it is worth. The geographical position of Arizona and its few rivers exclude it from a place in the usual river and harbor appropriation bills, but its proportion of care from the general government could fairly come in this proposed form. A thorough search over the Territory, directed solely to finding and storing water, of which the results should be currently made known, would be of great and peculiar utility. It would convert large tracts of waste land into thriving settlements, and would have a timely influence in settling the location of important railways. The structure of the country in many places admirably favors the building of a succession of dams on the water-courses, which are dry in summer, but in which the abundant water of the wet seasons could be held in reservoirs sufficient to maintain necessary supplies. There are many deep ravines and gorges strikingly well fitted for the purpose. The material is at hand for their easy and cheap construction. They could be constructed in such way that trees would quickly grow upon the dams and the borders of the reservoirs, which would become permanent lakes, numerous over the country, and improving with time. Such works for water storage, together with artesian and flowing wells, would undoubtedly furnish the water which, if not absolutely essential to the settlement of the country, is certainly so to its quick and general development.

One great railroad has already partially traversed Arizona, and three others are heading into and converging upon the southern border of the Territory, for which but a few years ago Indians were contesting possession and effectually driving back the population and enterprise for which it is now fast becoming a focus. These railroads which are to traverse the Territory are being built without aid from the government, although the national domain is being enriched and made habitable by their presence. The aid which I have suggested in furtherance of this growth would be only a slight contribution on the part of the government towards enriching the wide domain which a grand private enterprise has made practicable to settlement. And the certainty of an increased immigration from disturbed conditions abroad makes this a favorable moment for putting the unoccupied Territories into the best condition for receiving it.

Very respectfully, your obedient servant,

J. C. FRÉMONT,
Governor of Arizona Territory.

Hon. CARL SCHURZ,
Secretary of the Interior.

REPORT

OF THE

SURVEYOR-GENERAL OF ARIZONA.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., November 15, 1879.

SIR: Respectfully referring to departmental letter of the 5th September last, requesting this office to instruct the surveyors-general of the Territories to transmit to the department such information as they possess or may be able to obtain relative to the resources and development of the Territories, I have the honor to transmit herewith the report of the United States surveyor-general of Arizona upon the resources of that Territory, dated September 24, 1879.

I have the honor to be, very respectfully,

J. M. ARMSTRONG,
Acting Commissioner.

Hon. CARL SCHURZ,
Secretary of the Interior.

UNITED STATES SURVEYOR-GENERAL'S OFFICE,
Tucson, Ariz., September 24, 1879.

SIR: I have the honor to acknowledge the receipt of your letter of the 8th instant (E), directing me to prepare and forward certain information for use of the honorable Secretary of the Interior in his forthcoming annual report, and reply as follows:

According to departmental estimate made some years ago, Arizona contains just about 73,000,000 acres of land, 5,000,000 of which are surveyed. The general character of the topography, soil, proportion of arable land, productions, pasturage, minerals, timber, water, &c., is the same as that of New Mexico, Colorado, Utah, Nevada, and Idaho. The Territory was created by act of Congress approved in February, 1863. For ten years its progress was slow, because of the constant hostilities of the Indians, its isolation, and lack of speedy and cheap transportation. The United States census of 1870 showed a population of 9,658, exclusive of Indians, but owing to the danger of Indian attacks and the refusal of the military authorities to furnish the marshal with available assistance, he made no effort to enumerate some settlements. Under authority of Territorial law a census was taken in 1876, showing about 30,000, exclusive of Indians; but the enumeration was made by and under special direction of the several counties, and as legislative representation was based thereon, and the location of the capital depended on the action of the legislature thus formed, the said census was made to show a much-larger population than existed. Conservative estimates place the present population, exclusive of Indians, at from 30,000 to

33,000, with a steady and rapid increase. The population of nearly all the towns is visibly increasing, and new towns and mining camps have sprung up during this year.

There are three marked divisions of surface land in Arizona, viz: valley, mountain, and mesa, or table, their areas rating in the order named.

FIRST DIVISION.

The Gila Valley is about 400 miles in length, extending from east to west through the entire Territory, in latitude 33°. At nearly all points there is very productive land from a few rods to a few miles in width—at some places four to six. The river carries water enough in ordinary years of rainfall to raise one crop, and occasionally a spring and fall crop the same year.

Salt River Valley is about 60 miles in length by from 1 to 20 in width. It lies north of the Gila, and forms a junction with it about 125 miles from the entrance of the Gila into the Colorado. Salt River is a large stream, and is replenished by numerous streams having their rise in the eastern part of the Territory and in mountains cut by deep cañons, and covered for the most part with timber. This valley is properly termed the "granary of Arizona," because of its large production of wheat, barley, and corn.

Little Colorado Valley extends from the east boundary line in a westerly and northwesterly course to the main Colorado. The cultivatable land of it amounts to an average of about 5 miles wide and 100 in length. The river has its sources in timbered and broken mountains, and carries water enough to raise at least one crop a year. For many miles, perhaps near 100, before it unites with the main Colorado, it passes through narrow and rocky cañons.

The Verde Valley begins north of Prescott and south of the Black Mesa, extends eastward about 60 miles, and thence southward nearly 75, to a junction with Salt River Valley, near the head of the latter. Abrupt cañons hug the stream at many places, yet perhaps one-half the length of the valley has rich land, varying in width to from a few rods to a mile or more. The Verde River is not large, but carries water in the driest years, and usually ample for crops and stock.

The last three named are principal valleys north of the Gila, but there are many small ones, such as Kirkland, Skull, Date Creek, Williamson, Big and Little Chino, Aqua Fria, Hassayampa, Big Sandy, Williams's Fork, &c.

South of the Gila are San Simon, Sulphur Spring, San Pedro, Tonoita, Babacomori, Santa Cruz, Cienega, Arivaca, and Arivaipai. San Simon opens in New Mexico, and extends northward to a junction with the Gila over 100 miles in length, and borders close on New Mexico just east of the Chiricahua and Graham Mountains. San Simon River is trifling, and sinks long before reaching the Gila, yet shallow wells are only needed to find water. It cannot be relied upon for agriculture, but is valuable for stock.

Sulphur Spring Valley lies west of the Chiricahua and east of the Dragoon Ranges, both of which have many springs and some brooks. It has no stream of note, but is long and wide, and covered with rich grass, and is one of the choicest cattle ranges in Arizona.

San Pedro Valley lies west of the Dragoon Range and the famous Tombstone mining district. It extends from Sonora to the Gila, a distance of, say, 150 miles in Arizona, with a width of rich land of at least an average of one mile. It is coursed by a never-failing stream, but under any ordinary system of irrigation the water is insufficient to irrigate

one-half the land so as to insure good crops. The valley is supposed to be largely covered with private land-claims, and hence, so far, has been mainly used for stock growing, for which the grants were made, though in the northern part, where these claims are considered of doubtful validity, many thrifty farmers have made homes.

Lying 50 miles to the west, and parallel to the San Pedro, is the Santa Cruz Valley, which extends from Sonora over 100 miles northward, covering the old towns of Tubac and Tucson, and in which there are several old and noted missions that were established more than 100 years ago. The Santa Cruz is a living stream to a point 8 miles north of Tucson, where it sinks; but the rich land extends farther, and shallow wells afford water for many herds of stock. As in most others, the valley land is narrow, but much barley, corn, wheat, vegetables, and some fruit is produced, and by an economic system of irrigation, these products can be quadrupled.

Stretching along our entire western boundary is the Colorado Valley. The greater part of the rich land of this valley lies west of the river, yet there are some hundreds of thousands of acres on the Arizona side. The most barren of the table lands in the Territory slope towards and in many places hug the river. Some of this table-land would produce by irrigation, and by expensive appliances the water of the great Colorado can be made to reclaim millions of acres. Taken as one vast body, the land for many miles on either side of the river is a practical desert. However, there are immensely rich tracts here and there, and just below and above Yuma this is notably true.

SECOND DIVISION.

The mountain land is generally covered with grass, on which stock fatten the year round. It embraces nearly all the timber of commercial value, and substantially all mines of the precious and common metals. It contains many springs and small streams, with small tracts of rich land. Rocky and precipitous surfaces of comparatively limited extent exist, but, taken as a whole, the mountain land of Arizona is of incalculable value for minerals, timber, water, and grass. There are no long and very well-defined mountain ranges, although the various broken parts might be treated as ranges, and for local purposes they have distinctive names. The fact is, the surface of Arizona is a succession of buttes and mountains, with extended table-land, and narrow, rich valley land between. A stranger to the merits of our mountain land, on first sight, naturally enough regards it as next to worthless. The timber is mostly hidden in deep cañons and beyond sight about the summits, and, without toilsome examination, is as superficially unrecognizable as are the mineral treasures hidden below the surface; and it is a fact that, in most of the mountain land stretching from Mexico to British Columbia in this longitude, the most productive silver mines are found in mountains with the least vegetation and of the most uninviting appearances. Estimated in dollars, our mountain land is of greatest worth, and for centuries, perhaps forever, they will be peopled by many thriving cities, towns, and smaller settlements, reaping above the average reward for their industry.

THIRD DIVISION.

This division is, in my judgment, the largest in area, but least sought for. Its principal value is for stock growing, and its worth for this purpose is much diminished for two important reasons, which Congress can and should remove, viz: For several years past Congress has forbidden

its survey out of current appropriations for public surveys, and under existing legislation title can be obtained to only 160 acres in an honest way directly from the government, and not to this quantity until after the settler advances money to pay for survey to the extent of all the surveyable land in a township or more, according as township lines may touch his claim; and in some instances this also involves payment for connecting lines with existing surveys. Much of this table land has productive soil, and but very little of it can be called barren, though practically it is for anything but grass and timber for fuel. Its elevation is such that irrigation from the streams is impracticable as a rule. Under proper legislation the development of artesian water would follow. But valuable as this land is and may be, under present restrictions, even rich men will not use much of it in any defined sense, and will improve that just as little as possible to serve present needs. Most of it has no marketable value in small tracts. Many miles of it are treeless and waterless, but if it could be purchased at fair prices in bodies large enough to induce capitalists to develop water by artesian or other wells, only a few years would elapse ere it would be largely acquired and turned to practical account by development of water, growing of trees and other vegetation, whose influence for good would extend over the country around, and the poor and rich be alike benefited. It is idle to hope that these vast areas of pasturage and mesa lands will ever be largely turned to practical account, to say nothing of the best account, by poor men. Under suitable legislation nine-tenths of the land of Arizona would soon be bought and turned to good use, to the benefit of all classes, including government. Under existing laws not one-half will be made useful to poor or rich or government in the next two centuries. This waterless and treeless land should be suitably surveyed and sold to actual settlers or to those who would develop water on and otherwise improve it, at a nominal price and in bodies from a quarter to a whole township, according to circumstances. The law ought to contain clearly defined but reasonable conditions regarding improvements. It is nonsense to continue to hold this land as it has been apparently, as "land for the landless" and "homes for the homeless," in the demagogical sense these expressions are commonly used.

TIMBER RESOURCES.

All of the rich valleys, the larger areas of the mountains, and some of the table land bear timber; that of the valleys consisting of palo verde, cottonwood, and mesquite; that of the mountains, pine, fir, oak, ash, and other varieties of more or less commercial value; and on the table land, mesquite, juniper, scrub cedar, and other inferior varieties.

Owing to its great worth for fuel, mesquite is important, and is abundant in all the rich valleys. Tucson is perhaps two centuries old, and mesquite is and has been the fuel used, and at this day it is plentiful within sight north and south of town.

In nearly all the mountains in the central, southern, eastern, and northern sections, pine, fir, and oak timber abounds. Commencing in the San Francisco mountains to the north and east of Prescott, and covering volcanic plateaux and mountains for 150 miles eastward to and into New Mexico, there are large bodies or belts of fine pine, interspersed with much good fir, oak, ash, &c., and is mostly easy of access; whereas south of the Gila Valley, the timber valuable for lumber and building generally is mostly found in canons and high in the mountains, and is in larger bodies and of better quality than is understood by many old residents, the new comers finding and turning it to account. Ari-

zona is quite plentifully supplied with timber, but its distribution is not convenient.

COAL.

Coal of proven value is known to exist in only one locality, and that at a presently inaccessible place in the White Mountains, and understood to be on the Fort Apache and San Carlos Indian Reservation. This coal body has not been largely developed, but it is undoubtedly large. Discoveries have from time to time been reported in other sections, but it is quite certain they are mere "prospects" and of unproved extent or value. Railway extensions over Arizona will soon solve the coal problem.

PRODUCTIONS GENERALLY.

Everything produced in the temperate zone, and many things native to the tropics, are successfully grown in Arizona. Wheat, barley, and corn are the leading grains. Irish and sweet potatoes flourish; garden vegetables in general; all the fruits of tree and vine; and limited but successful experiments have been made in growing cotton and sugar-cane.

All the domestic animals and fowls are grown and are healthy. The several businesses of growing cattle, horses, mules, and sheep are assuming large proportions, and many blooded animals have been brought from abroad at large cost. Hogs do well. Choice ham and bacon are cured and preferred to the imported articles. The magnitude and permanency of mining in Arizona must always insure large home demands for local products, and, therefore, good prices will prevail, and in no other section of our common country will the industries be more varied or better rewarded.

Our mineral productions embrace about all varieties demanded by the world at large. Gold and silver, lead and copper, are found in every mountain within our borders, and in some of them to an extent that is in the highest degree encouraging not only to our own people, but to investors in every leading city of the North and East, and to some extent of Europe. Iron is known to exist, but for obvious reasons it has attracted no practical attention. Prospects of tin have been frequently reported.

There are no readily available statistics of mineral production. The several county assessors should, and, I believe, are required by law to, procure periodical statements of gold and silver production, but the duty is evidently poorly performed. A few weeks ago, Hon. H. Burchard, Director of the Mint, requested me to supply him with gold and silver statistics. I immediately addressed the several assessors and requested the information, but as yet not one has responded. Prior to 1879, bullion was generally transported by private hands and by mail, and hence the impossibility of procuring even an approximate aggregate of production of the precious metals; and as opinions differ so widely thereon, I forego even a conjecture, but will say the product is large, and, perhaps, meets the sanguine expectations of producers. Reduction works erected this year are now shipping from $25,000 to $50,000 per month, and it is a gratifying fact that developments are gradually and surely disclosing richer and larger mines in every county in the Territory.

CLIMATE, HEALTH, ETC.

The climate of Arizona is as varied as that of California. From April to October the air is decidedly warm in the valleys, and from cool to freezing as the summits of mountains are approached. Excepting

during the cloudy and rainy months of July and August, the nights are invariably cool. December is usually a frosty month in the valleys, and light frosts run through three or four months therein. Snow falls and lies in the mountains until in June in some places, but rarely falls to any depth in the lowest valleys, and never lies two successive days, except in places protected from the sun's rays. The greatest rainfall occurs in July and August, but considerable is due in November and January, and some years quite heavy falls occur in February or March. Like other statistics, those of climate have been imperfectly kept, but of late years the few military posts and signal service stations have recorded them; but the limited time I have been given to prepare and forward this communication forbids a previous correspondence with the proper officers. The quickest way to procure climatic data of Arizona would be upon an application to the Signal Bureau in Washington.

A residence of nearly ten years here convinces me that this climate (of Arizona at large) is healthy. Of course, there is sickness, and some of it unquestionably is caused by local influences, but compared to most newly developed sections, this is healthy. Bronchial, catarrhal, and pulmonary ailments are generally relieved and often cured by simply good care, without medicine or medical advice. Great as is the summer heat in the low valleys, sunstroke is unknown, although deaths from excessive use of intoxicating liquors are sometimes published as caused by sunstroke; perhaps only in deference to the memory of the victims and the feelings of their friends.

TRANSPORTATION.

Railways, steamboats, wagons, and stage coaches carry our freights, passengers, and mails. In April, 1878, the Southern Pacific Railway of California crossed the Colorado and opened business in Arizona. Construction was then suspended, but resumed in November, and early in May this year 182 miles more were built to a point only 66 miles from Tucson, and work again suspended; and next month its construction will be resumed, Tucson reached by Christmas, and the Rio Grande by January, 1881. By this road we have direct connections with San Francisco, Oakland, Santa Monica, and Wilmington, on the Pacific Ocean. It is being built without subsidy of any kind. A connecting line between Tucson and the Gulf of California at Guaymas is in contemplation, but the restrictions imposed by the Mexican Government make the work one of doubt in the near future.

Announcement is made that the Atchison, Topeka and Santa Fé Company has a corps of engineers *en route* to Tucson to view out a direct line to the company's projected crossing of the Rio Grande at Albuquerque.

The Arizona legislature last February passed an act to aid in the construction of a railroad from Prescott, via Phœnix, to Maricopa, a station on the Southern Pacific. The act requires the counties (Maricopa and Yavapai) through which the road is to pass to issue $400,000 in bonds in aid thereof, without permitting the question to be passed upon by a vote of the people. These counties are already burdened with heavy debts for local improvements, and there seems to be a popular opposition to the issuance of the bonds, without which this road will not soon be built, unless unexpectedly rich developments occur along the line.

The Colorado River forms our entire western boundary, and it is navigable the whole distance at all seasons for light-draught steamers. Prior to the advent of the railway, the bulk of all Arizona freight came via the Pacific Ocean in large vessels to the mouth of the river,

and was there transferred to the river craft. Passengers and mails came by stage via San Diego and San Bernardino, Cal. The railway has changed all this, and these routes are almost abandoned, though much freighting is done on Colorado River steamers north of Yuma, where the railway crosses. A little Eastern freight and a few passengers come via New Mexico, but costly experience has induced the sending of nearly all freight to Arizona via California, and even some for Western New Mexico takes the same route. Arizona mails, express, and passengers, between Arizona and all important points west, north, and east, pass over the California route, and the time between here and points east of the Mississippi River is nine to eleven days. Freights from Eastern cities to Arizona vary according to class, and to give reliable information in this respect would involve the copying of much of the schedules of various transportation companies. The average freight charge from Tucson to New York is about 7½ cents per pound, and first-class fare for passengers $201.50.

The Territory is liberally supplied with mail service, which in the main is faithfully performed.

Wagon and stage roads are mostly natural, that is, without expensive grades or embankments or bridges, and as such are probably not surpassed in the world; but on most of them for short distances there should be expensive work done to make them easily passable at all seasons. The United States has, by Congressional appropriation, expended $15,000 on one road near Prescott, under military supervision, and the common expression is that nothing was accomplished save the destruction of a good pack-trail. This Territory has appropriated and expended many thousands of dollars to build roads with like useless results. In sections of country like Arizona, roads of costly construction and maintenance should be left to private enterprise, and their standards of tolls and excellence be governed by law. The Territory and counties would bankrupt themselves in building roads, and have none of worth in the end.

Arizona is highly favored with telegraphic facilities. The lines of the Signal Service extend to all but two or three of the military posts and to all the towns of much importance. Ten-word messages cost only twenty-five cents within a circuit of 200 miles, and fifty cents over that distance and under 400, with one and two cents per additional word.

PUBLIC EDUCATION.

Every settlement with fifteen to twenty children of school age is provided with a public school. Provision is made by Territorial law for an ample school fund by direct tax levies and from licenses and escheated estates. This efficient system was the result of eight years' steady devotion to the work by Hon. A. P. K. Safford, when governor. When he entered upon his duties in June, 1869, there was not a public school in Arizona nor a public school law of any value, and before he retired from the office the present effective system was perfected.

Society has greatly improved during the past few years, and families need no longer hesitate to come to Arizona in the fear that the essentials of good society and educational facilities are wanting.

Very respectfully, your obedient servant,

JOHN WASSON,
Surveyor-General.

Hon. J. A. WILLIAMSON,
Commissioner General Land Office, Washington, D. C.